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# Diffusion, Coulombic interactions and multicomponent ionic transport of charged species in saturated porous media

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Diffusion and compound-specific mixing significantly affect conservative and reactive transport in groundwater at different scales, not only under diffusion-dominated regimes but also under advection-dominated flow through conditions [1]. When dissolved species are charged, besides the magnitude of their aqueous diffusion coefficients also the electrostatic interactions significantly affect solute displacement. We investigated electrostatic interactions between ionic species under flow-through conditions resulting in multicomponent ionic dispersion: the dispersive fluxes of the different ions in the pore water are cross-coupled due to the effects of Coulombic interactions. Such effects are illustrated in flow-through experiments in saturated porous media. Simple strong electrolytes (i.e., salts and strong acid solutions) were selected as tracers and their transport was studied under different advection-dominated conditions in homogeneous and heterogeneous porous media [2-3]. The model-based interpretation of the experimental results is challenging since it requires a multicomponent ionic formulation with an accurate description of local hydrodynamic dispersion and explicitly accounting for the cross-coupling of dispersive fluxes due to the Coulombic interactions between the ions in the pore water [4-5].

**Keywords:** Coulombic interactions, flow-through experiments, transport in porous media

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